dvr 2-2

Operator's Manual

Kantronics
RF Data Communications Specialists

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RF Data Communications Specialists

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We have attempted to make this manual technically and typographically correct as of the date of the current printing. We solicit your comments and/or suggested corrections. Please send to Kantronics Co. Inc., 1202 E. 23rd Street, Lawrence, KS 66046.

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Introduction

Congratulations and thank you for purchasing the *dvr 2-2*.

The *dvr 2-2* was designed to provide both voice and data operation. The design emphasizes fast receive-to-transmit and transmit-to-receive switching along with quick FM signal carrier detection. These are the basic features needed to have a good packet data link.

The back panel data port provides all the signals necessary to connect your TNC, including, discriminator output for unsquelched and unshaped audio output and direct varicap input for high speed and direct drive modems. The mic connector provides PTT, speaker audio out, and audio in.

Channel 1 of the *dvr 2-2* comes with crystals installed at the factory. (U.S. versions will have 145.01 MHz and European versions will have 144.675 MHz.) A cable and DB-9 connector are provided to connect the *dvr 2-2* data port to your TNC. For voice operation, you can connect a Kantronics microphone and an external speaker to the *dvr 2-2*. A power cable with a Molex connector is also provided.

Your new *dvr 2-2* will provide you with many years of reliable service, but should you experience any problems, please refer to the section entitled "In Case of Difficulty" in this book. If you determine that the unit requires service, refer to the "Return/Repair Procedures" for information on returning the unit for service.

Precautions

Please read this operating manual carefully before placing the transceiver in service.

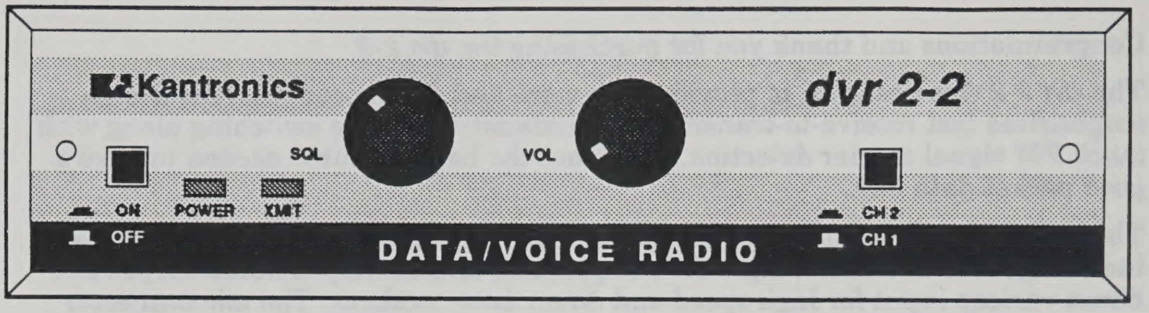
Before connecting the radio to your power supply, be sure you have your supply properly grounded. Connecting the unit to a DC voltage source in excess of 13.8 volts may result in damage to the unit.

The microphone connector has speaker audio present on pin 3; grounding this pin will damage the audio amplifier. Many commercially available microphones connect pin 3 to ground. We recommend you use only the Kantronics microphone with this radio.

FCC Statement

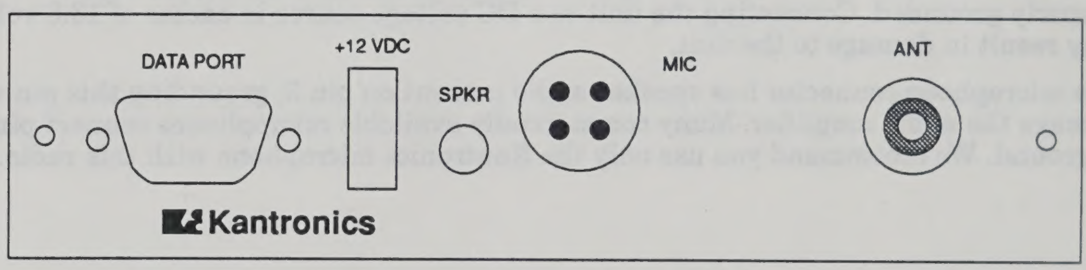
This unit complies with Part 15, Subpart C of the Federal Communications Commission Rules and Regulations in effect as of the date of manufacture.

Front Panel Controls and Indicators



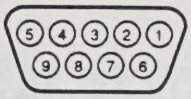
1. Power on/off switch. This is a push-push type of switch which applies power to your transceiver. When pressed in, power is applied.
2. Power (green) LED. This LED will illuminate when the *dvr 2-2* is powered on.
3. Xmit (red) LED. This LED will illuminate when the *dvr 2-2* is transmitting.
4. Squelch control. This control is used to set the proper squelch threshold level. This control does not affect unsquelched audio out at pin 5 of the DB-9.
5. Volume control. This control adjusts the audio signal level at the external speaker jack, pin 3 of the mic connector, and pin 8 of the data port (DB-9 on the rear panel). This control does not affect unsquelched audio out at pin 5 of the DB-9.
6. Channel select switch. This push-push switch selects the transceiver frequency. The out position selects channel 1, in selects channel 2.

Rear Panel Connectors



1. DATA PORT – DB-9 connector – input connector for direct connection of all required signals to and from your TNC.
2. +12VDC – Power – 2 pin molex connector for 12VDC. Current draw is less than 1 ampere.
3. SPKR – External speaker jack – 3.5 millimeter jack for external 8 ohm speaker, or connection to the audio input of your TNC.
4. MIC connector – 4 pin mic connector for optional Kantronics microphone.
5. ANT – Antenna – BNC connector for connection to a 50 ohm antenna.

DATA PORT DB-9 Connector



Female (Looking at Holes)

Pin 1 – Data Input – This connection accepts the input from your TNC to be transmitted over the radio. Normally this is the AFSK from your TNC. This input is sent through a buffer as direct input to the varicap for modulation.

Pin 2 – Carrier Detect – This pin provides an active low (ground) when a signal is present on the frequency.

Pin 3 – Push-To-Talk – Applying a ground to this pin causes the radio to transmit.

Pin 4 – Unused – THIS PIN IS RESERVED FOR FUTURE USE AND SHOULD NOT BE CONNECTED.

Pin 5 – Unsquelched Audio Out – This pin is the direct discriminator output, providing audio to your TNC. This audio has not been processed (it is UNSQUELCHED and UNSHAPED).

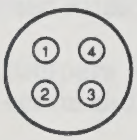
Pin 6 – Ground – This pin is connected to the common ground of the radio.

Pin 7 – Unused – THIS PIN IS RESERVED FOR FUTURE USE AND SHOULD NOT BE CONNECTED.

Pin 8 – Speaker Audio Out – The audio available on this pin has been processed and is affected by the front panel squelch and volume controls. This pin is connected directly to the speaker output jack.

Pin 9 – Ground – This pin is connected to the common ground of the radio.

4-pin MIC Connector



Male (Looking at Pins)

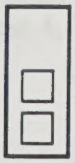
Pin 1 – Audio In – This pin accepts the audio from your microphone or TNC to be transmitted.

Pin 2 – Push-To-Talk – Grounding this pin causes the radio to transmit.

Pin 3 – Speaker Audio Out – This pin provides speaker audio. This is processed audio, and is controlled by the front panel squelch and volume controls. (This audio is not available when an external speaker is connected to the SPKR jack.)

Pin 4 – Ground – This is connected to the common ground of the radio.

Power Connector



– Minus voltage – This is connected to the common ground of the radio.

+ Plus voltage – Apply +12 volts to this pin to power the radio.

Installation

1. Place your *dvr 2-2* in the desired operating location.
2. Connect the *dvr 2-2* power cable to a regulated 12V dc supply. (Red lead is positive). **WARNING**: Connecting the power backward will result in a blown fuse inside the *dvr 2-2*. Do not attempt to open the *dvr 2-2* until you have read the disassembly instructions.
3. Connect an antenna to the BNC connector located on the rear panel of the radio. The antenna should present a 50 ohm load to the transceiver. As with all antenna installations, you should follow standard safety precautions including the installation of a high quality lightning arrestor in your antenna line to protect against fire, personal injury or possible damage to the radio.
4. An 8 ohm external speaker may be connected to the 3.5mm jack on the rear panel labeled "SPKR".
5. The optional Kantronics microphone may be connected to the mic connector on the rear panel. **CAUTION**: Pin 3 of the mic connector is speaker audio. Grounding this pin could damage your transceiver.
6. A TNC may be connected to the *dvr 2-2* data port or mic connector. Following is information on how to connect the Kantronics KAM, KPC-4, KPC-2, KPC-2400, and KPC-1 to the data port. Information is also provided for connecting the AEA PK-232 and MFJ-1270 to the data port. For connecting other TNCs, or connecting to the mic connector, refer to the *dvr 2-2* connector diagrams (see Rear Panel Connectors) for a description of the signals available.

Connecting Your Kantronics TNC to the *dvr 2-2*

The *dvr 2-2* was designed to be pin compatible with the VHF port connector on the KAM, and is also pin compatible with the radio ports on the KPC-4, KPC-2, and KPC-2400. Wire the supplied DB-9 connector from the dataport of the *dvr 2-2* to your Kantronics TNC using the supplied 5 conductor cable as described below.

KAM/KPC-4

The recommended hookup for the KAM VHF port and the KPC-4 is as follows:

Connect pins 1, 2, 3, 5 and 6 from the selected port (VHF port for the KAM) to the *dvr 2-2* DB-9 connector on the same pins. This will supply all the required signals for proper operation.

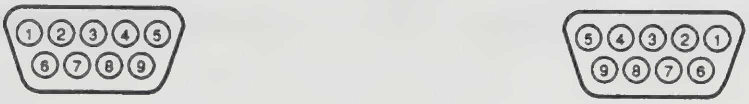
Next you will need to set your TNC for no equalization. This is accomplished by placing the K1 jumper in the KAM so that it connects the center pin of the header with the pin marked 1 on the board. On the KPC-4, you would use jumper K1 for PORT 1 and K2 for PORT 2. These are set for no equalization by connecting the center pin with the pin marked 1 on the board.

It is also necessary to turn the EXCARDET command ON, allowing the radio to supply the carrier detect indication to the KAM/KPC-4.

Radio Pin Name	***dvr 2-2* Pin**	**KAM/KPC-4 Pin**	**TNC Pin Name**
Data Input	1	1	AFSK Out
Carrier Detect	2	2	XCD
Push-to-Talk	3	3	PTT
Unsquelched Audio Out	5	5	Audio Signal
Ground	6	6	Ground

Set TNC jumpers for no equalization
Set TNC command: EXCARDET ON

DB-9 Connector



Male (Looking at Pins)

Female (Looking at Holes)

NOTE:
Pins 4, 7, and 9 are reserved for future use and should not be connected to your TNC.

KPC-2/KPC-2400

On the KPC-2/KPC-2400 you should connect pins 1, 2, 3, and 6 from the TNC to the *dvr 2-2* DB-9 connector on the same pins. The KPC-2 and KPC-2400 will not operate properly with the unsquelched and unshaped audio provided by pin 5 of the *dvr 2-2*, so you should connect pin 8 of the *dvr 2-2* to pin 5 of the KPC-2/KPC-2400. This will provide speaker audio to the input of your TNC, and this audio is affected by the front panel volume and squelch controls.

Now set the equalization to none by using the command EQUALIZE OFF. Connect an external speaker to the external speaker jack on the rear panel of the *dvr 2-2*, and adjust the squelch control just beyond the point where the open squelch can be heard through an external speaker. If you don't use an external speaker, you can adjust the squelch control to the point where the RCV led on your TNC goes out.

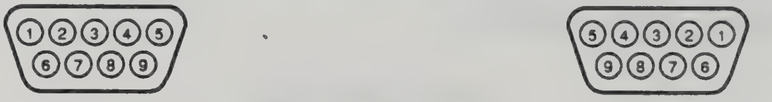
We recommend setting the EXCARDET command ON in these units to allow the radio to provide carrier detection to the KPC-2/KPC-2400.

If you are using the KPC-2400 at 2400 baud, you can connect the unsquelched and unshaped audio (pin 5 of the *dvr 2-2*) to the audio input (pin 5) of the KPC-2400, instead of connecting to the speaker audio from pin 8 of the *dvr 2-2*.

Radio Pin Name	***dvr 2-2* Pin**	**KPC-2/2400 Pin**	**TNC Pin Name**
Data Input	1	1	AFSK Out
Carrier Detect	2	2	XCD
Push-to-Talk	3	3	PTT
Ground	6	6	Ground
Speaker Audio Out	8	5	Audio Signal

Set TNC commands:
EQUALIZE OFF
EXCARDET ON

DB-9 Connector



Male (Looking at Pins)   Female (Looking at Holes)

NOTE:
Pins 4, 7, and 9 are reserved for future use and should not be connected to your TNC.

KPC-1

Connecting your KPC-1 to the *dvr 2-2* requires the following connections:

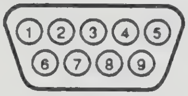
Pin 1 from the KPC-1 din connector should be connected to pin 1 of the DB-9 on your radio. Pin 2 of the KPC-1 connects to pin 6, and pin 3 of the KPC-1 will connect to pin 3 on the radio. Connect the external speaker jack from the *dvr 2-2* to the audio input jack on the rear panel of the KPC-1.

Now set the equalization to none by using the command EQUALIZE OFF. Connect an external speaker to the external speaker jack on the rear panel of the *dvr 2-2*, and adjust the squelch control just beyond the point where the open squelch can be heard through an external speaker. If you don't use an external speaker, you can adjust the squelch control to the point where the RCV led on your TNC goes out.

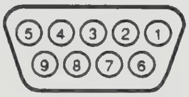
Radio Pin Name	***dvr 2-2* Pin**	**KPC-1 Pin**	**TNC Pin Name**
Data Input	1	1	AFSK Out
Push-to-Talk	3	3	PTT
Ground	6	2	Ground
External Speaker Jack	–	–	Audio Input Jack

Set TNC command: EQUALIZE OFF

DB-9 Connector

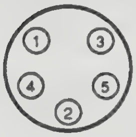


Male (Looking at Pins)

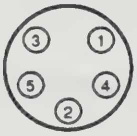


Female (Looking at Holes)

5-Pin Din



Male (Looking at Pins)



Female (Looking at Holes)

NOTE:
Pins 4, 7, and 9 are reserved for future use and should not be connected to your TNC.

Connecting Other TNCs to the *dvr 2-2*

AEA PK-232

Pin 1 of the *dvr 2-2* will connect to pin 2 of the 232's 5 pin radio connector (white wire on the AEA supplied cable).

Pin 2 from the *dvr 2-2* may be used to supply the carrier detect by connecting this to pin 3 (black) on the TNC (optional).

Pin 3 of the *dvr 2-2* will connect to pin 5 on the 232 (red wire).

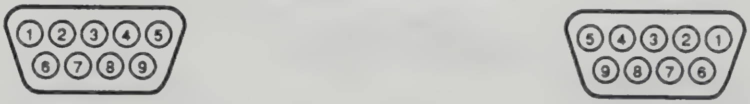
Pin 6 of the *dvr 2-2* connects to pin 4 on the 232 (brown wire).

Pin 8 from the *dvr 2-2* may be connected to pin 1 (green) on the PK-232, providing speaker audio (controlled by the front panel volume and squelch controls).

(Although the *dvr 2-2* is capable of supplying unsquelched and unshaped audio to the TNC, we have not tested the PK-232 in this configuration. If you want to use the unsquelched audio from pin 5 of the *dvr 2-2*, we suggest you contact AEA for instructions concerning the use of unshaped audio.)

Radio Pin Name	***dvr 2-2* Pin**	**PK-232 Pin**	**TNC Pin Name**
Data Input	1	2	TX Audio
Carrier Detect	2	3	SQ
Push-to-Talk	3	5	PTT
Ground	6	4	Ground
Speaker Audio Out	8	1	RX Audio

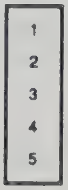
DB-9 Connector



Male (Looking at Pins)

Female (Looking at Holes)

PK-232 Connector



NOTE:
Pins 4, 7, and 9 are reserved for future use and should not be connected to your TNC.

MFJ-1270 or equivalent

Pin 1 of the *dvr 2-2* will connect to pin 1 of the 5 pin din connector on the rear panel of the TNC.

Pin 2 of the *dvr 2-2* may be used to supply the carrier detect by connecting this to pin 5.

Pin 3 of the *dvr 2-2* connects to pin 3.

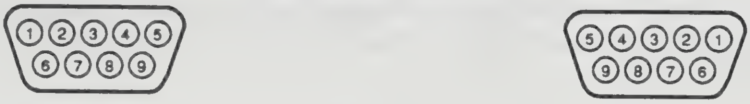
Pin 6 of the *dvr 2-2* connect to pin 2.

Pin 8 of the *dvr 2-2* connects to pin 4. This supplies speaker audio which is controlled by the front panel volume control.

(Although the *dvr 2-2* is capable of supplying unsquelched and unshaped audio to the TNC, we have not tested the MFJ TNCs in this configuration. If you want to use unsquelched audio from pin 5 of the *dvr 2-2*, we suggest you contact MFJ for instructions concerning the use of unshaped audio.)

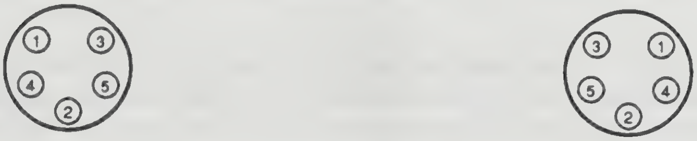
Radio Pin Name	***dvr 2-2* Pin**	**MFJ-1270 Pin**	**TNC Pin Name**
Data Input	1	1	Microphone audio
Carrier Detect	2	5	Squelch input (optional)
Push-to-Talk	3	3	PTT
Ground	6	2	Ground
Speaker Audio Out	8	4	Receive audio

DB-9 Connector



Male (Looking at Pins) Female (Looking at Holes)

5-Pin Din



Male (Looking at Pins) Female (Looking at Holes)

NOTE:
Pins 4, 7, and 9 are reserved for future use and should not be connected to your TNC.

Operations

Voice Operation

Connect your microphone to the rear panel mic connector. An external speaker is required, and should be connected to the rear panel speaker jack. Connect your radio to a regulated 12 volt dc power supply and your antenna.

Turn the unit on by depressing the front panel power switch and select the desired frequency using the front panel channel select switch. Adjust the squelch and volume controls as desired.

To transmit, press the push-to-talk switch on the microphone and speak in a normal tone of voice across the face of the mic. You should hold the mic approximately 2 inches (5 cm) from your lips when speaking. To receive, release the push-to-talk switch.

Data Operation

Connect your TNC to the DB-9 connector on the rear panel of the *dvr 2-2*. The antenna should be connected to the BNC connector labeled "ANT", and 12 VDC should be applied to the unit through the rear panel power connector. Turn the unit on with the front panel power switch and select the desired operating frequency with the front panel channel selector switch.

The transmitter will come up to full operating power within 5 milliseconds after the push-to-talk line is pulled to ground, allowing your TXDELAY setting to be extremely short. Typically a TXDELAY setting of 1 would allow full power to be present before the data begins. However, since the receiving station requires some time to detect the presence of your signal (squelch time), you will need to increase your TXDELAY to account for this.

The *dvr 2-2* has been designed to detect a signal present on frequency within 10 milliseconds (squelch time). This means that if you are communicating with another *dvr 2-2*, you can set your TXDELAY at 2 and allow sufficient time for your transmitter to come up to full power and for the receiving *dvr 2-2* to detect the presence of your signal.

When operating with the unsquelched audio output (pin 5 of the *dvr 2-2*), many TNCs require the use of an external means to detect the presence of a signal. This is provided by the *dvr 2-2* on pin 2 of the DB-9 connector (CD). Pin 2 will be pulled low (ground) when a received signal is detected, and therefore can signal the TNC to demodulate the signal. On the Kantronics KAM, KPC-4, KPC-2, and KPC-2400, this is accomplished by connecting pin 2 of the *dvr 2-2* to pin 2 of the TNC and setting the EXCARDET command ON.

TXDELAY Settings

The *dvr 2-2* is capable of operating with a TXDELAY setting of 2 if you are talking to another user who has a *dvr 2-2*. In many cases, you may be talking with someone who is using a radio that does not provide the high speed switching necessary to use these fast settings, and therefore you will need to increase your TXDELAY to operate effectively. This will also be true if you are using a digipeater which has a slower radio connected to it. To test the amount of TXDELAY required for a specific digipeater, set your UNPROTO command to include the desired digipeater as the first digipeater in your path. Then enter the converse mode and press a return. This will cause a packet to be sent through the digipeater, but the digipeater will not repeat it unless it has heard the packet completely. Next, start increasing your TXDELAY slowly and try transmitting another packet. Continue this process until your packets are reliably repeated by the digipeater. If you have the MONITOR command ON, you will be able to monitor your digipeated packets on your terminal.

If you use several different digipeaters, repeat this process with all of them, and then set your TXDELAY for the worst case you found in your tests (highest value of TXDELAY).

NOTE: Many nodes (Net/Rom®, TheNet, etc.) will not allow the digipeating of packets. In these cases, you will need to attempt to connect to the node, increasing your TXDELAY until you reliably establish a connection.

In Case of Difficulty

Power light fails to light

1. Check to be sure the *dvr 2-2* is connected to a source of 12 volts DC.
2. Check the polarity of your 12 volt supply – red lead is positive. If the power was connected with reverse polarity, the fuse inside the *dvr 2-2* will have to be replaced. (See assembly/disassembly instructions.) The fuse is a one-amp 3AG type fuse.

No audio output from external speaker jack

1. Check to be sure external speaker is plugged in to the rear panel speaker jack. Be sure it is firmly seated in the connector.
2. Check the volume control to ensure it is not turned all the way counter-clockwise.
3. Be sure power is turned on to the radio.

No audio output from microphone jack (pin 3)

1. The speaker audio will not be present on this pin if an external speaker is connected to the rear panel speaker jack.

Unit will not transmit

1. Be sure the push-to-talk line (pin 3 of the DB-9 port or pin 2 of the microphone connector) is properly connected to your TNC or microphone.
2. Apply a ground to pin 3 of the DB-9 or pin 2 of the mic connector, and check the front panel transmit LED. If it lights, this indicates a problem with the microphone or TNC connection.

Unit transmits, but no audio is present

1. Check the connection to your TNC or microphone. The proper input level from a TNC to pin 1 of the DB-9 modem connector is 50 mv peak-to-peak.
2. If the TNC input appears to work properly, but the microphone does not, check the 5 pin header connector inside the rear panel of the radio for proper connection. (Refer to the assembly/disassembly section for instructions on opening your *dvr 2-2*.)

Disassembly Instructions

1. Disconnect all cables from the *dvr 2-2*.
2. Remove the front panel knobs from the *dvr 2-2*. This is accomplished by pulling the knobs straight forward.
3. Loosen the two screws that mount the rear panel to the bezel far enough to allow the rear panel and bezel assembly to be pulled away from the case.
4. Carefully slide the entire rear panel and circuit board assembly out of the case.
5. To remove the rear panel, unscrew the two mounting nuts which secure the rear panel to the DB-9 connector, and remove the connector which attaches the mic jack to the circuit board.

Assembly Instructions

1. Attach the mic jack cable to the circuit board.
2. Install the back panel onto the circuit board, securing it with the two mounting nuts into the DB-9 connector.
3. Carefully insert the circuit board assembly into the rear of the case. Ensure that the LEDs, knobs and switches properly line up with the cutouts in the front panel. If desired, you may find it easier to remove the front panel until the board is secured in place.
4. Secure the rear panel to the case with the two screws provided.
5. Install the front panel knobs.

Ordering Crystals

You may wish to order additional crystals for your *dvr 2-2* radio. These may be ordered from any reputable crystal manufacturer, and the following information will assist you in specifying your requirements to the crystal manufacturer. Channel 1 of the *dvr 2-2* comes with crystals installed at the factory. (U.S. versions will have 145.01 MHz and European versions will have 144.675 MHz.)

Crystal Frequency

To calculate the transmit crystal frequency, divide the desired operating frequency by eight (8).

Tx Xtal Freq = Transmit Frequency (MHz) / 8

For the receive crystal, you must subtract the IF frequency from the operating frequency and then divide by 8.

Rx Xtal Freq = (Receive Frequency (MHz) – 10.7) / 8

The crystal should be specified as an AT cut, with 20 pico-farad shunt capacitance. The case style used is HC-50. Many of the common operating frequencies are listed in the charts below. Refer to chart 1 to determine the proper crystal frequency for the transmit crystal. Refer to chart 2 to select the proper crystal for the desired receive frequency.

Chart 1 – Transmit Crystals

Transmit Freq	Tx Xtal	Transmit Freq	Tx Xtal
144.00	18.00000	145.61	18.20125
144.91	18.11375	145.68	18.21000
144.93	18.11625	146.52	18.31500
144.95	18.11875	146.16	18.27000
144.97	18.12125	146.22	18.27750
144.99	18.12375	146.28	18.28500
145.01	18.12625	146.31	18.28875
145.03	18.12875	146.34	18.29250
145.05	18.13125	147.63	18.45375
145.07	18.13375	147.68	18.46000
145.09	18.13625	147.84	18.48000
145.57	18.19625	148.00	18.50000
145.59	18.19875		

Chart 2 – Receive Crystals

Receive Freq	Rx Xtal	Receive Freq	Rx Xtal
144.00	16.66250	145.61	16.86375
144.91	16.77625	145.68	16.87250
144.93	16.77875	146.52	16.97750
144.95	16.78125	146.76	17.00750
144.97	16.78375	146.82	17.01500
144.99	16.78625	146.88	17.02250
145.01	16.78875	146.91	17.02625
145.03	16.79125	146.94	17.03000
145.05	16.79375	147.03	17.04125
145.07	16.79625	147.08	17.04750
145.09	16.79875	147.24	17.06750
145.57	16.85875	148.00	17.16250
145.59	16.86125		

Installing Crystals in the *dvr 2-2*

If you are installing crystals in channel 2, insert the receive crystal in socket X3 (see parts layout), and the transmit crystal in socket X2.

If you have access to a Service Monitor, we suggest you use it for adjusting the new crystals for proper frequency. If you do not have a Service Monitor, you may use an accurate frequency counter to adjust the transmit crystal.

Key the *dvr 2-2* and adjust coil L22 to place the dvr on the desired transmit frequency. NO FURTHER ADJUSTMENTS ARE NECESSARY.

Set the Service Monitor to generate a 1 μ-volt signal on the desired receive frequency, and modulate it with a 1 KHz tone causing 3 KHz deviation. Apply this signal to the antenna connector, and connect the external speaker jack to the audio input of the Service Monitor. Next adjust coil L21 to provide best signal-to-noise ratio or SINAD reading. If you do not have a Service Monitor for this step, you will have to tune L21 by trial and error, while listening to other stations on your desired receive frequency.

If you choose to replace the channel 1 crystals, the new receive crystal will be installed in socket X5, and the new transmit crystal will be installed in socket X4. To tune the channel 1 transmit frequency, adjust L24. Tuning of the channel 1 receive frequency is accomplished by adjusting L23.

If desired, Kantronics will install and tune crystals for a nominal fee. You must contact the Service Department (913) 842-4476 to obtain a return authorization number for this service. They can also advise the current charges for this service. Failure to obtain a return authorization number may result in the unit being returned unopened.

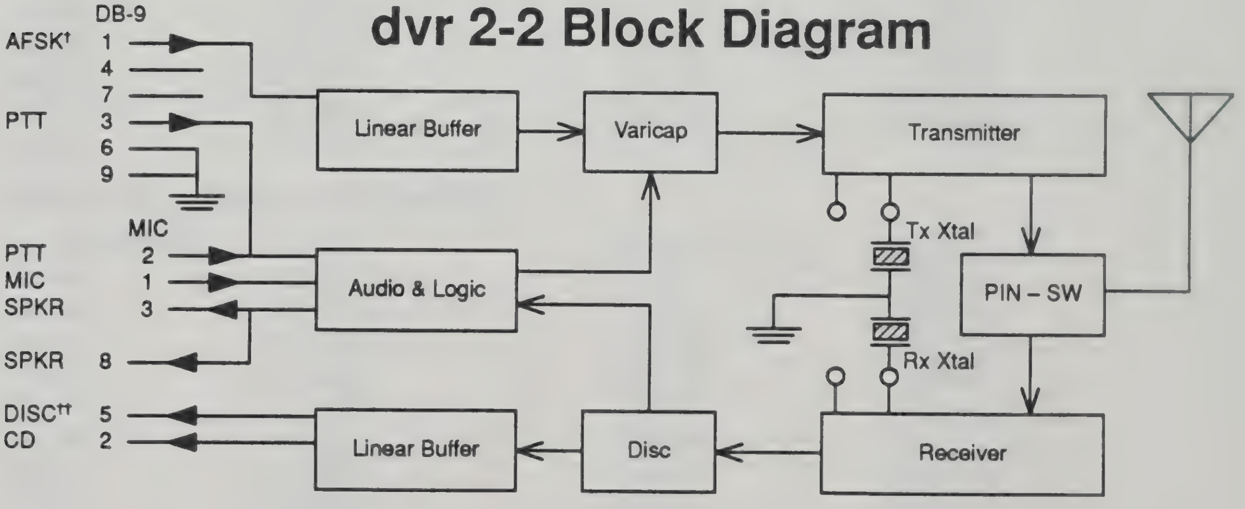
Block Diagram Description

A block diagram of the *dvr 2-2* is shown below. On the transmit side, the unit consists of a linear input data buffer, microphone amplification circuit, varicap modulation circuit, transmit crystal oscillator, multiplier chain, power amplifier chain, and PIN diode output switching. On the receive side, the circuit consists of an input PIN diode switch, an rf amplifier, the complete receiver chip, crystal oscillator and multiplier chain for the LO (local oscillator), an op-amp buffer for the direct detector data output, and an audio amplifier with squelch function.

The crystal oscillators utilize fundamental crystals, AT cut, where the crystal frequencies are 1/8th the transmit and LO frequencies respectively. Low-side LO is utilized; for example, with a signal of 145.01 MHz, the LO will be 10.7 MHz less, or 134.31 MHz. The multiplier chains generate the transmit and LO frequencies from the crystal oscillators.

For voice transmission, mic gain, pre-emphasis, limiting, and low-pass filtering of audio is accomplished within the multiplier chain chip. A separate mic connector is provided on the back panel. For data transmission, a DB-9 connector is also provided on the back panel and includes DATA IN, DATA OUT, AND PTT lines. The data in signal is amplified and summed into the varicap drive circuit along with the mic signal. The varicap circuitry is utilized to FM modulate the transmit crystal oscillator.

On reception, audio from the quadrature detector in the receiver chip is applied to both an audio amplifier and a buffering op-amp chip. The audio amplifier provides drive to an optional 8-ohm speaker and may also be used as a low-speed data output, such as 1200 baud traditional packet. The data out signal is a direct-coupled output of the op-amp and detector circuitry, and no equalization audio processing has been effected. The data carrier detect signal, also at the DB-9 data connector, is derived from a carrier detect circuit within the receiver chip and is also controlled by the squelch potentiometer. Output data at the DB-9 is independent of squelch setting; that is, it is not affected at all. Squelch controls speaker output as would be expected.



dvr 2-2 Block Diagram

Specifications

General

Frequency range: 144 to 148 MHz
U.S. version shipped with 145.01 MHz crystals
European version shipped with 144.675 MHz crystals

Modes: F3E (FM), F2D (AFSK), F1D (FSK) direct

Power requirements: 12 VDC ±15%
< 50 ma receive
< 1 amp transmit

Fuse: 1 amp, 3AG type

Antenna impedance: 50 ohms

Frequency stability: 10 ppm

Operating temperature: 0 to 50 deg. C (32 to 122 deg. F)

Dimensions (W x H x D): 1-3/4" x 6" x 8"

Weight: < 2 lbs.

Transmitter

Output power: >2 watts

Duty cycle: 100%

Modulation: varicap

Spurious radiation: – 60 dB

Maximum frequency deviation: ±5 KHz

Microphone impedance: 600 ohms

Data drive: 50 mv p-p, 600 ohm load, for ±3 KHz ground reference

Receiver

Circuitry: double conversion superhet

Intermediate frequency
1st IF: 10.7 MHz
2nd IF: 455 KHz

Sensitivity (12 dB SINAD): less than 0.6 μV

Selectivity
– 6 dB: more than 15 KHz
– 60 dB: less than 30 KHz

Detector output
direct data receive: 50 mv p-p to 600 ohm load
direct coupled: offset nominally 300 mv
(modem is expected to AC couple, DC restore or otherwise process signal)

Speaker Output (5% distortion): more than 1 watt / 8 ohm load

External speaker impedance: 8 ohms

Specifications subject to change without notice.

Return/Repair Procedures

Should you feel that your unit is malfunctioning, you should contact the Kantronics Service Department (913-842-4476) between the hours of 9AM-12N or 2PM-5PM Central Time to obtain a return authorization number (RA number). The unit may then be returned to the factory at 1202 E. 23rd Street, Lawrence, KS 66046 for service. Please include a letter indicating the problem you are experiencing and, if appropriate, the method of payment for repairs. Kantronics will accept Master Card or Visa, or you may elect to have your unit returned to you COD.

If, upon inspection, Kantronics finds no defect with the unit, and the owner failed to obtain a return authorization number, Kantronics will charge a minimum of 1/2 hour labor at the currently prevailing labor rates to cover inspection and testing of the unit, plus shipping charges for return of the unit to the customer.

Warranty

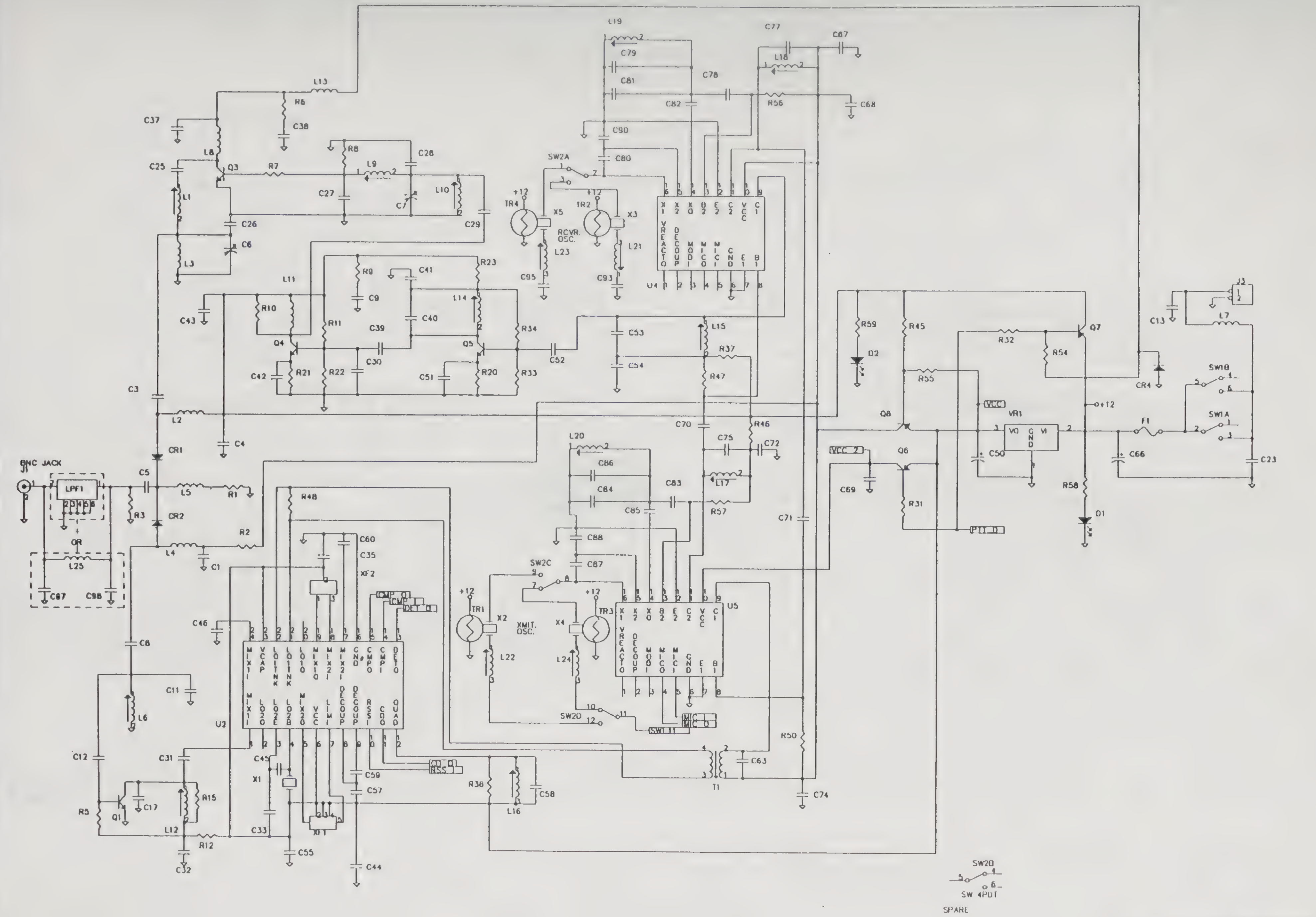
Kantronics Company, Inc. warrants this device to be free from defects in material and workmanship for a period of six (6) months from the date of purchase (90 days for final power transistor). In the event your unit fails to operate according to specifications within the warranty period, Kantronics will repair or replace (at our option) any component determined to be defective by our inspection. This warranty does not apply to damage caused by misuse, abuse, over-voltage, or any other cause beyond our reasonable control.

In order to be informed of future enhancements which may be made to this unit, you should return your warranty registration card within 15 days from date of purchase, and include a copy of your sales receipt.

dvr 2-2 Parts List

C1 – 470pF
C2 – 470pF
C3 – 470pF
C4 – 470pF
C5 – 470pF
C6 – 7-25pF
C7 – 7-25pF
C8 – 4.7pF
C9 – .1uF
C10 – 470pF
C11 – 15pF
C12 – 47pF
C13 – 470pF
C14 – 470pF
C15 – 470pF
C16 – 4.7uF
C17 – 12pF
C18 – .01uF
C20 – 470pF
C22 – 220uF
C23 – .01uF
C25 – .001uF
C26 – 47pF
C27 – 39pF
C29 – .001uF
C30 – 56pF
C31 – 39pF
C32 – .001uF
C33 – 47pF
C34 – .01uF
C35 – .01uF
C36 – .1uF
C37 – 470pF
C38 – .1uF
C39 – 15pF
C40 – 22pF
C41 – 470pF
C42 – 180pF
C43 – .001uF
C44 – .1uF
C45 – 18pF
C46 – .01uF
C47 – 220uF
C48 – 220uF
C49 – 470pF
C50 – .47uF
C51 – 470pF
C52 – 5.6pF
C53 – 27pF
C54 – .001uF
C55 – .01uF
C56 – .1uF
C57 – .1uF
C58 – 180pF
C59 – .1uF
C60 – .01uF
C61 – 120pF
C62 – .018uF
C63 – 33pF
C64 – .001uF
C65 – 470pF
C66 – 220uF
C67 – .001uF
C68 – 470pF
C69 – 470pF
C70 – 10pF
C71 – 10pF
C72 – .001uF
C73 – .0022uF
C74 – .001uF
C75 – 68pF
C76 – .047uF
C77 – 68pF
C78 – 33pF
C79 – 68pF
C80 – 33pF
C81 – 100pF
C82 – 47pF
C83 – 33pF
C84 – 56pF
C85 – 47pF
C86 – 68pF
C87 – 27pF
C88 – 27pF
C89 – 470pF
C90 – 33pF
C91 – .0027uF
C92 – .033uF
C93 – 22pF
C94 – .047uF
C95 – 22pF
CR1 – MPN3404
CR2 – MPN3700
CR3 – 1N914
CR4 – 1N4003
CR5 – 1N914
CR6 – 1N914
CR7 – MV2105
D1 – Green LED
D2 – Red LED
F1 – Fuse Holder
FS1 – 1 amp AGC Fuse
J1 – BNC Connector PC Mount
J2 – 5pin header
J3 – Right-angle Header
J4 – 3.5mm Jack
J5 – DB9F PCMount
J6 – 9pin header
J7 – 4pin mic connector
L1 – .049uH
L2 – 1.2uH Choke
L3 – 2.5 Turns #26awg 1/8 diameter coil
L4 – 1.2uH Choke
L5 – 1.2uH Choke
L6 – .060uH
L7 – 21-200J Ferrite Bead
L8 – 1.2uH Choke
L9 – .065uH
L10 – .163uH
L11 – 1.2uH Choke
L12 – .060uH
L13 – 21-200J Ferrite Bead
L14 – .046uH
L15 – .0445uH
L16 – 790uH
L17 – .076uH
L18 – .076uH
L19 – .134uH
L20 – .134uH
L21 – 3.2uH
L22 – 3.2uH
L23 – 3.2uH
L24 – 3.2uH
LPF1 – Low Pass Filter
Q1 – MPS5179
Q2 – 2N4401
Q3 – MRF237
Q4 – MPS3866A
Q5 – MPS3563
Q6 – 2N4403
Q7 – 2N4403
Q8 – 2N4403
R1 – 470 ohm
R2 – 2.2K ohm
R3 – 100K ohm
R4 – 2.2K ohm
R5 – 270K ohm
R6 – 10 ohm
R7 – 2.2 ohm
R8 – 100 ohm
R9 – 22 ohm
R10 – 1.5K ohm

R11 – 2.2K ohm
R12 – 560 ohm
R13 – 1K ohm
R14 – 10K ohm
R15 – 2.2K ohm
R16 – 100K ohm
R17 – 220K ohm
R18 – 2.7 ohm
R19 – 680 ohm
R20 – 220 ohm
R21 – 33 ohm
R22 – 390 ohm
R23 – 100 ohm
R24 – 18K ohm
R25 – 18K ohm
R26 – 82K ohm
R27 – 18K ohm
R28 – 18K ohm
R29 – 430K ohm
R30 – 2.2K ohm
R31 – 27K ohm
R32 – 2.2K ohm
R33 – 1K ohm
R34 – 2.7K ohm
R35 – 10M ohm
R36 – 68K ohm
R37 – 270 ohm
R38 – 10K ohm
R39 – 100K ohm
R40 – 220K ohm
R41 – 7.5K ohm
R42 – 7.5K ohm
R43 – 220 ohm
R44 – 390 ohm
R45 – 15K ohm
R46 – 750 ohm
R47 – 100K ohm
R48 – 100 ohm
R49 – 82K ohm
R50 – 390K ohm
R51 – 82K ohm
R52 – 390K ohm
R53 – 1K ohm
R54 – 1.5K ohm
R55 – 7.5K ohm
R56 – 390K ohm
R57 – 390K ohm
R58 – 1K ohm
R59 – 1K ohm
R60 – 8.2K ohm
R61 – 47K ohm
R62 – 33K ohm
R63 – 22K ohm
RV1 – 100K ohm potentiometer
RV2 – 10K ohm potentiometer
SW1 – Push-Push Switch
SW2 – Push-Push Switch
T1 – .049uH
U1 – LM380N
U2 – MC3362P
U3 – LM324
U4 – MC2833P
U5 – MC2833P
VR1 – LM78L05
X1 – 10.245MHz
X2 – Xtal Socket
X3 – Xtal Socket
X4 – Xtal Socket
X5 – Xtal Socket
XF1 – IF Filter 455 KHz
XF2 – IF Filter 10.7 MHz
XTAL4– 18.12625MHz
XTAL5– 16.78875MHz



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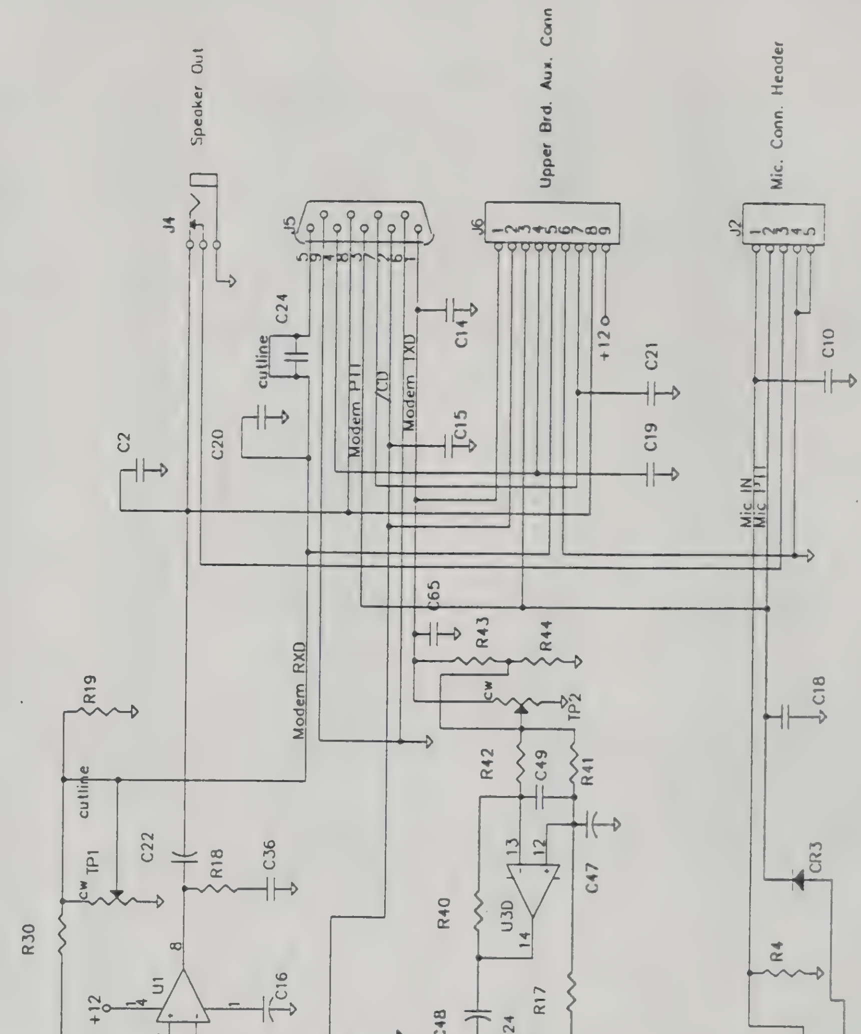

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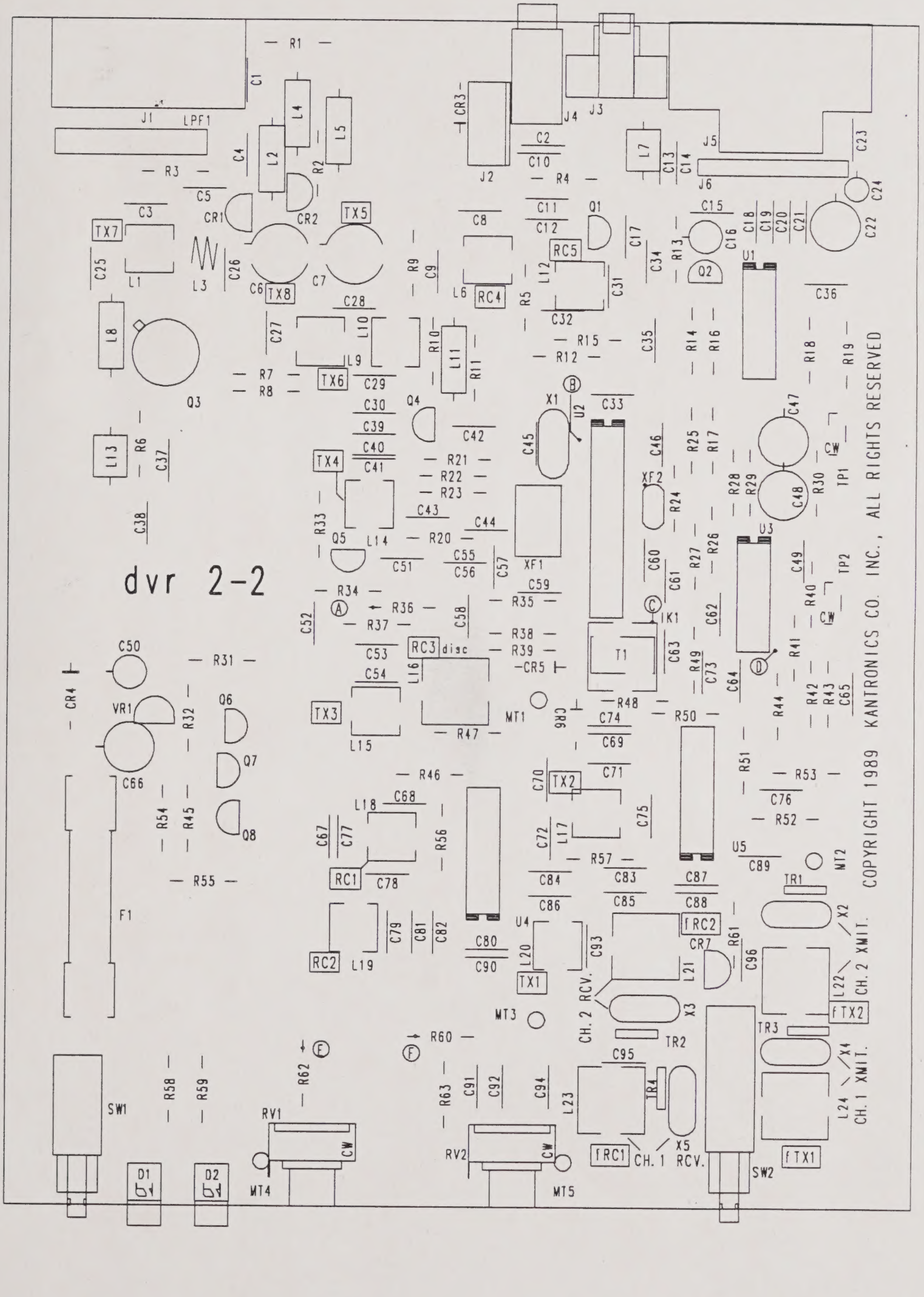
dvr 2-2
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J1
LPF1
R1
C1
L4
L5
C4
L2
R2
R3
C5
CR1
CR2
C3
TX7
TX5
TX8
C25
L1
L3
C26
C6
C7
L8
Q3
C27
C28
L10
L9
TX6
R7
R8
C29
C30
C39
C40
C41
TX4
L13
R6
C37
C38
R9
C9
R10
L11
R11
Q4
C42
R21
R22
R23
R33
Q5
L14
C43
R20
C44
C51
C55
C56
C57
R34
R36
R37
C52
C53
C54
RC3 disc
L16
TX3
L15
R47
MT1
C50
R31
CR4
VR1
R32
Q6
Q7
Q8
C66
R54
R45
R55
F1
R46
L18
C68
C67
C77
RC1
C78
R56
RC2
L19
C79
C81
C82
C80
C90
U4
L20
TX1
C93
MT3
R60
R62
R63
C91
C92
C94
RV1
RV2
CW
MT4
MT5
SW1
R58
R59
D1
D2
CR3
J4
J3
J2
C2
C10
R4
C8
C11
C12
Q1
RC5
L6
RC4
R5
L12
C31
C32
R15
R12
C35
X1
U2
C33
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XF1
C59
R35
R38
R39
CR5
CR6
IK1
T1
R48
C74
C69
C70
TX2
C71
C75
C72
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R57
C84
C83
C86
C85
L21
CH. 2 RCV.
X3
TR2
C95
L23
TR4
X5
FRC1
CH. 1 RCV.
L7
C13
C14
J5
J6
C23
C24
C15
C16
C17
C34
R13
Q2
C18
C19
C20
C21
C22
U1
C36
R14
R16
R18
R19
C46
XF2
R24
R25
R17
C47
R28
R29
R30
C48
TP1
U3
C60
C61
R27
R26
C62
C49
TP2
R40
R41
C63
R49
C73
C64
R42
R43
C65
R44
R50
R51
R53
C76
R52
U5
C89
MT2
C87
C88
FRC2
CR7
R61
C96
TR1
X2
L22
CH. 2 XMIT.
FTX2
TR3
X4
L24
CH. 1 XMIT.
SW2
FTX1
A
B
C
D
E
F